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Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines[1]

This standard is issued under the fixed designation B 16; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This specification has been approved for use by agencies of the Department of Defense and for listing in the DoD Index of Specifications and Standards.

1. Scope

1.1 This specification covers free-cutting brass (Copper Alloy UNS No. C36000[2]) rod, bar, and shapes of any specified cross-section, suitable for high-speed screw machine work. For special cases rod ½ in. and under may be furnished in coils.

NOTE 1—A complete metric companion to Specification B 16 has been developed—B 16M; therefore, no metric equivalents are presented in this specification.

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.1.1 *ASTM Standards:*

B 249 Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, and Shapes[3]

B 250 Specification for General Requirements for Wrought Copper-Alloy Wire[3]

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast[3]

E 8 Methods of Tension Testing of Metallic Materials[4]

3. Ordering Information

3.1 Orders for material under this specification shall include the following information:

3.1.1 Temper (see 6.1),

3.1.2 Form: cross section such as round, hexagonal, square, etc. (see 8.2 and 8.3),

3.1.3 Diameter or distance between parallel surfaces (see 8.2),

3.1.4 Length (see 8.4) or coils,

3.1.5 Edge contours (see 8.6),

3.1.6 Weight: total for each size,

3.1.7 ASTM designation and year of issue,

3.1.8 Certification, if required (see Specification B 249, Section 13), and

3.1.9 Mill test report, if required (see Specification B 249, Section 14).

3.2 When material is purchased for agencies of the U.S. Government, this shall be specified in the contract or purchase order, and the material shall conform to the Supplementary Requirements as defined in the current issue of Specification B 249.

4. General Requirements

4.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification B 249 or Specification B 250.

5. Chemical Composition

5.1 The material shall conform to the chemical requirements of Table 1.

5.2 These specification limits do not preclude the presence of other elements. Limits may be established by agreement between manufacturer or supplier and purchaser for these unnamed elements. Either copper or zinc may be given as remainder and may be taken as the difference between the sum of all elements analyzed and 100 %. When all elements in the table are analyzed, their sum shall be 99.5 % minimum.

6. Temper

6.1 Available tempers are as listed below. Current designations and the new designations in Practice B 601 are shown.

Temper Designation	
Standard	Former
O60	soft anneal
H02	half-hard
H04	hard

6.2 H02 (half-hard) temper rods and bars shall be furnished unless otherwise specified in the contract or purchase

TABLE 1 Chemical Requirements

Element	Composition, %
Copper	60.0–63.0
Lead	2.5–3.7
Iron, max	0.35
Zinc	remainder
Copper and named elements, min	99.5

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[1] This specification is under the jurisdiction of the ASTM Committee B-5 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rods, Bars, and Shapes.

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[2] The UNS system for copper and copper alloys (see Practice E 527) is a simple expansion of the former standard designation system accomplished by the addition of a prefix "C" and a suffix "00." The suffix can be used to accommodate composition variations of the base alloy.

[3] *Annual Book of ASTM Standards,* Vol 02.01.

[4] *Annual Book of ASTM Standards,* Vols 02.01 and 03.01.

TABLE 2 Tensile Requirements

Temper Designation		Diameter or Distance Between Parallel Surfaces, in.		Tensile Strength min ksi[A]	Yield Strength at 0.5 % Extension under load min ksi[A]	Elongation in 4 Diameter or Thickness of Specimen, min, %[B]
Standard	Former					
		Rod				
O60	soft anneal	1 and under		48	20	15
		over 1 to 2, incl		44	18	20
		over 2		40	15	25
H02	half-hard	½ and under		57	25	7[C]
		over ½ to 1, incl[D]		55	25	10
		over 1 to 2, incl		50	20	15
		over 2 to 4, incl		45	15	20
		over 4		40	15	20
H04	hard	¹⁄₁₆ to ³⁄₁₆, incl		80	45	. . .
		over ³⁄₁₆ to ½, incl		70	35	4
		over ½ to ¾, incl		65	30	6
		Bar				
		Thickness, in.	Width, in.			
O60	soft anneal	1 and under	6 and under	44	18	20
		over 1	6 and under	40	15	25
H02	half-hard	½ and under	1 and under	50	25	10
		½ and under	over 1 to 6	45	17	15
		over ½ to 2	2 and under	45	17	15
		over ½ to 2	over 2 to 6	40	15	20
		over 2	over 2 to 4	40	15	20

[A] ksi = 1000 psi.
[B] In any case a minimum gage length of 1 in. shall be used.
[C] For material furnished in coils the elongation shall be 4 %, min.
[D] If specified for thread rolling applications the minimum tensile strength shall be 52 ksi.

order. Material for applications requiring thread rolling should be so specified in the contract or purchase order. Physical requirements of drawn shapes shall be agreed upon between the manufacturer and the purchaser at the time of placing the order.

7. Mechanical Requirements

7.1 The material shall conform to the requirements as to tensile properties prescribed in Table 2 and as to Rockwell hardness prescribed in Table 3. The Rockwell hardness tests, as far as they are prescribed, shall be the basis for acceptance of material, unless agreement cannot be reached. In such cases, final acceptance or rejection shall be decided by the tensile requirements.

8. Dimensions and Permissible Variations

8.1 The dimensions and tolerances for material covered by this specification shall be as prescribed in the current edition of Specifications B 249 or B 250, with particular reference to Section 5 and the following tables of those specifications.

8.2 *Diameter or Distance Between Parallel Surfaces:*

8.2.1 *Rod in Lengths: Round, Hexagonal, Octagonal*—See 5.2, Table 1 of B 249.

8.2.2 *Rod in Coils: Round*—See 5.2, Table 1 of B 250.

8.2.3 *Bar: Rectangular and Square*—See 5.2, Tables 8 and 10 of B 249.

8.3 *Shapes*—The dimensional tolerances for shapes shall be as agreed upon by the manufacturer or supplier and the purchaser, and shall be specified in the order.

8.4 *Length of Rod, Bar, and Shapes*—See 5.3, Tables 12 and 13 of B 249.

8.5 *Straightness of Rod and Bar*—See 5.4, Table 15 of B 249.

8.6 *Edge Contours*—See 5.5 of B 249.

9. Test Specimens

9.1 In the tension test all material shall be pulled in full size when practicable. Full-size or machined test specimens shall be as specified in Methods E 8.

NOTE 2—The tension test specimens shall conform to the dimensions prescribed in Section 4 of Methods E 8.

9.2 Whenever tension test results are obtained from both full size and from machined test specimens and they differ, the results obtained from full-size test specimens shall be used to determine conformance to the specification requirements.

TABLE 3 Hardness Requirements

NOTE—Rockwell tests are not established for diameters less than ½ in.

Temper Designation		Diameter or Distance Between Parallel Surfaces, in.		Rockwell B Hardness Determined on the Cross-Section Midway Between Surface and Center	
Standard	Former				
				Rod	
				Round	Hexagonal and Octagonal
O60	soft anneal	½ and over		10–45	10–45
H02	half-hard	½ to 1, incl[A]		60–80	55–80
		over 1 to 2, incl		55–75	45–80
		over 2 to 3, incl		45–70	40–65
		over 3 to 4, incl		40–65	35–60
		over 4		25 min	25 min
				Bar	
		Thickness, in.	Width, in.		
O60	soft anneal	½ and over	½ and over	10–35	
H02	half-hard	½ and under	1 and under	45–85	
		½ and under	over 1 to 6	35–70	
		over ½ to 2, incl	2 and under	40–80	
			over 2 to 6	35–70	
		over 2	over 2 to 4	35–70	

[A] If specified for thread rolling application the Rockwell B hardness shall be 55 to 75.

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